MAR 22 1939

The American Biology Teacher

VOL. 1 MARCH, 1939 NO. 6

The Opportunity and Obligation of the National Association of Biology Teachers - Oscar Riddle 115

A Simple Micro-Viewer - - - - - - Philip Goldstein 122

A Handling of the Topic: Cheese - - - - - - - Edith A. Purer 125

Biological Briefs - Ruth Sherman 126

Editorial Comment - - - - - - 128

Biology Teaching Aids - - - - 129

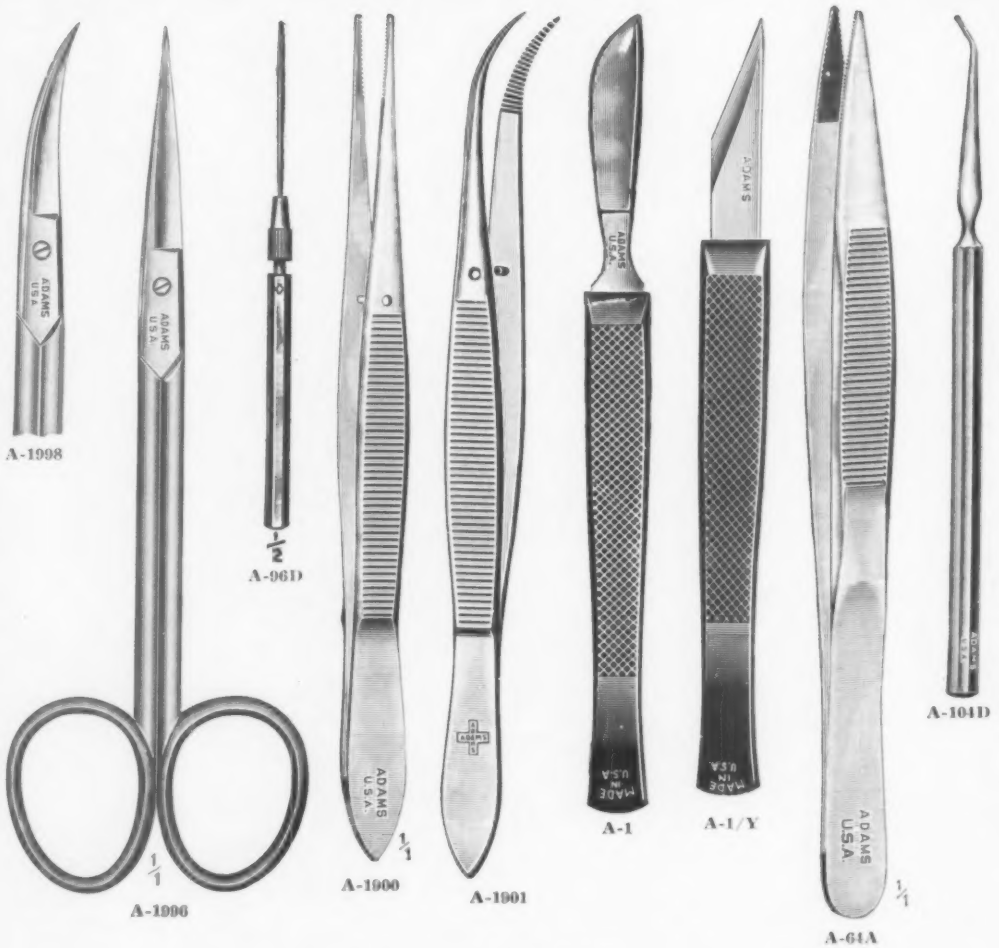
Suggestions for Laboratory Work in Bacteriology for High School Students - - C. M. Hilliard 134

News and Notes - - - - - - - 137

Books - - - - - - - - - - - - 140

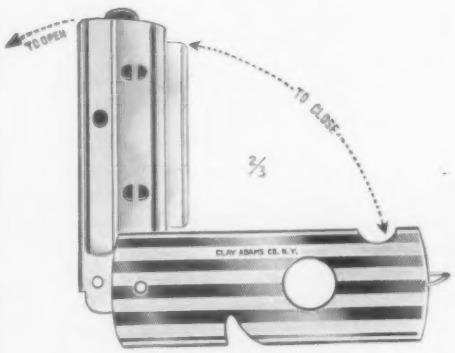
PUBLISHED BY
The National Association of Biology Teachers

AMERICAN MADE DISSECTING INSTRUMENTS



A-1998 A-96D A-1900 A-1901 A-1 A-1/Y A-104D

A-1996 A-64A



A-1 and A-1/Y

Bakelite handles of perfect balance and scientifically designed for maximum efficiency and comfort have molded into them scalpel blades made of highest grade cutlery steel.

A-40 Razor blade Knife "Super-Knife"

Takes standard double edge razor blade. Particularly well adapted for use in the biology laboratory, but also generally useful. Note that the blade can be turned around or changed in a jiffy and that the full length of the cutting edge can be used. Each in envelope with directions.

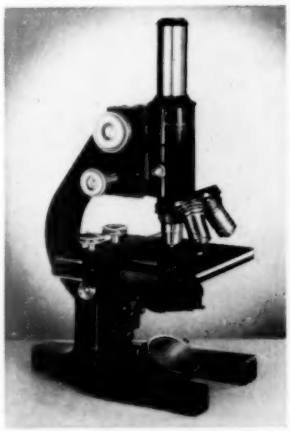
Our special catalog No. 125 illustrates and describes our complete line of "Dissecting Instruments and Sets, and Science Students Supplies." *A copy will be gladly sent on request.*

Quotations gladly supplied—please mention quantity.

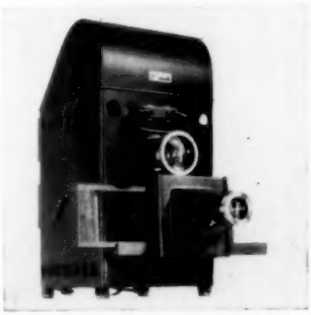
CLAY-ADAMS CO., Inc., 44 East 23rd St., New York

Application for entry as second-class matter applied for.

FOR SIMPLIFIED
PRACTICAL TRAINING



B&L TYPE H MICROSCOPE



B&L BALOPTICONS

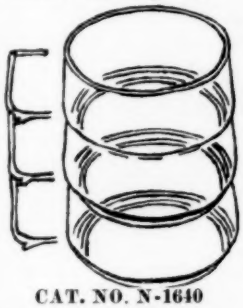
B&L Type H Microscopes are similar in all operating essentials to the instruments used in science and industry; they also are invaluable in familiarizing the student with microscopical technique he may be called upon to use in his business or professional life. For full information send for Catalog D-185.

B&L Balopticons, projecting vivid story telling pictures or diagrams so that an entire group can see, have amply demonstrated their usefulness in teaching students of all ages. For complete specifications of all models write for Catalog E-11. Bausch & Lomb Optical Co., 718 St. Paul St., Rochester, N. Y.

BAUSCH & LOMB

"THE HANDIEST DISH IN THE LABORATORY"

STANSCIEN HANDI-STACK Dishes are used in many Biological Laboratories for various purposes—such as, Small Aquaria, Culture Work, Specimen Isolation, Staining, etc.



1. They are made of Crystal Glass.
2. Easy to Stack. Easy for Observation. Saves Space.
3. Four Convenient Sizes.
4. Attractively Priced.

CAT. NO. N-1640

Sizes (Overall Dia.)	4″	4½″	8″	10″
Capacity (cc)	200	300	1600	3000
Price (dz.)	2.40	2.75	11.00	15.00

Immediate Delivery

STANDARD SCIENTIFIC SUPPLY CORP.

34-38 West 4th Street, New York, N. Y.

SERVICES FOR BIOLOGISTS

77 YEARS OLD. Ward's has supplied fine preparations for the Biological Sciences for over three-quarters of a century.

GREAT MUSEUMS. Practically every large museum of Natural history in America obtained the nucleus of its collection from Ward's.

UNIVERSITIES. Many Colleges and Universities are now using Ward's materials exclusively.

HIGH SCHOOLS. Operated not for profit, as a Foundation under the University of Rochester, Ward's are pleased to announce many fine new preparations to help the High School Biology Teacher. *Write today for illustrated catalogs and Bulletins.*

WARD'S NATURAL SCIENCE ESTABLISHMENT, INC.
EST 1862
312 W. Goodman St., Rochester, N. Y.
THE FRANK A. WARD FOUNDATION OF NATURAL SCIENCE OF THE UNIVERSITY OF ROCHESTER

THE AMERICAN BIOLOGY TEACHER

Publication of The National Association of Biology Teachers.
Issued monthly eight times during the school year from October to May.
Correspondence concerning manuscripts may be addressed to any of the Associate editors or directly to the editor-in-chief.
Business correspondence regarding advertising etc. should be addressed to the managing editor.
All other communications should be addressed to the secretary.

Association Officers

President: M. C. Lichtenwalter, Lane Technical High School, Chicago, Illinois.

President-elect: Malcolm D. Campbell, Dorchester High School for Boys, Boston, Massachusetts.

First Vice President: George W. Jeffers, State Teachers' College, Farmville, Virginia.

Second Vice President: Lucy Orenstein, Evander Childs High School, New York, New York.

Secretary-Treasurer: P. K. Houdek, Township High School, Robinson, Illinois.

Editorial Staff

Editor-in-Chief (acting):

I. Alex. Herskowitz
Christopher Columbus High School
Bronxwood and Waring Avenues
Bronx, New York City

Managing Editor:

J. S. Mitchell
University High School
Lexington, Kentucky

Assistant Managing Editors:

Alex. A. Fried
Christopher Columbus High School
New York City

I. P. Daniel
Lake View High School
Chicago, Illinois

Associate Editors

Herman C. Arneson
Bemidji High School
Pelican Rapids, Minn.

Peter A. Blate
109 Hyde Park Pl.
Tampa, Florida

Willis W. Collins
Idabel High School
Idabel, Oklahoma

L. C. Dingess
Yuma High School
Yuma, Arizona

Ruth A. Dodge
Johnstown High School
Johnstown, New York

Philip E. Foss
Hartford Public High School
Hartford, Connecticut

Elwood D. Heiss
State Teachers College
East Stroudsburg, Pennsylvania

Melvin A. Hintz
South Milwaukee High School
South Milwaukee, Wisconsin

Charles C. Herbst
Beverly Hills High School
Beverly Hills, California

Ray Kennelty
Du Bois High School
Du Bois, Pennsylvania

M. C. Lichtenwalter
Lane Technical High School
Chicago, Illinois

Helen G. Mank
Lawrence High School
Lawrence, Massachusetts

Thomas F. Morrison
Milton Academy
Milton, Massachusetts

M. A. Russell
Junior High School
Highland Park, Michigan

Ruth Sherman
David Starr Jordan High School
Los Angeles, California

J. L. Sloanaker
North Central High School
Spokane, Washington

J. A. Trent
State Teachers College
Pittsburg, Kansas

B. Bernarr Vance
Kiser High School
Dayton, Ohio

Guy F. Williams
Colby Junior College
New London, New Hampshire

Advisory Staff

E. V. Cowdry, Washington University, St. Louis, Missouri.

W. C. Curtis, Univ. of Missouri, Columbia, Mo.

B. C. Gruenberg, Sub-Treasury Bldg., New York City.

George W. Hunter, Claremont College, Claremont, California.

Paul B. Mann, Evander Childs High School, 800 Gun Hill Road, New York City.

D. F. Miller, Ohio State University, Columbus, Ohio.

Oscar Riddle, Carnegie Institute, Cold Spring Harbor, Long Island.

Edmund V. Sinnott, Columbia University, New York City.

The American Biology Teacher

Vol. 1 MARCH, 1939 No. 6

The Opportunity and Obligation of the National Association of Biology Teachers*

OSCAR RIDDLE

Carnegie Institution, Station for Experimental Evolution, Cold Spring Harbor, N. Y.

There is something humanly attractive and uncommonly refreshing about speaking to a new-born organization which is biological in both name and nature, and which has come into existence full-fledged and equipped—with answering voice, comprehending ears, sensitive eyes, and already straining for the joys of locomotion. The birth and baptism of any such organism is an event. The officers and members of this Association are to be warmly congratulated on having added the larger part of a thousand to its membership, founded a Journal (with three issues printed), obtained a place of joint responsibility in the Union of American Biological Societies, affiliated with the American Association for the Advancement of Science, planned and consummated a first national meeting—all within just 180 days from the time your delegates met in New York to give form and substance to this new organism. The new Association has arrived, it has taken its first strides, and it marches into an age and situation that greatly needs it.

It is already clear that your opportunity and obligation issue from the needs and dangers of your fellow citizens who wish to live in a democracy; from a civilization shaped, reshaped, and just now in rapid metamorphosis, by the generally uncomprehended results of science; from the too prolonged complacency of men of science; and from the present meagre and unsatisfactory place of science—life-science in particular—in the basic education of our people.

One may admit at the outset that not all that is needed can be accomplished directly by this Association, even though it succeeds in enlisting all those who teach or are interested in secondary school biology. But, this new social organism has both opportunity and obliga-

* Dinner Address (condensed), before the First Meeting of the N.A.B.T., Richmond, Va., Dec. 28, 1938.

tion to constitute itself a moving front rank—with which other divisions of our science can communicate and to which they can afford support. Your very existence therefore also creates a new opportunity and obligation for biologists in other fields, and for forward-looking educationists as well. We recall that one of the three greatest hereditary acquisitions of man—his *social* qualities—did not develop, and doubtless could not have developed, in a tandem series of isolated human beings; the evolution of those qualities hinged upon the recurrent presence of other, or of several other, companions. Thus too your new organization will in part act as ferment, stimulator and creator.

I believe you will share with me the thought that your Association and its Journal will assist in the development of professional spirit among teachers of secondary school biology—that group which contains more than two-thirds of all those in this country who are directly engaged in biological teaching or in research. Surely your Association and Journal—together with those new forces which your own existence and presence among us set in motion—should enable you to enroll most teachers of secondary school biology in your membership and, concurrently, do much toward fostering a professional spirit among those teachers.

Let our last word on this matter of professional spirit express a hope that there will be no diminution of your appreciation of efforts of your associates who teach certain other high school subjects. For example, though social studies are now competing strongly with life-science for larger place in the secondary school curriculum one of that group of subjects —namely *civics*—certainly ranks high in present needs of a politically stricken people. Personally I believe that a secondary school curriculum which does not provide for sound training in civics is itself a crime against good citizenship. High school biology teachers, and all other high school teachers, will give signal and lasting service to their country if they can hasten the day when it will be recognized that the first obligation of our secondary schools is to teach *civics* and *manners*, *science* and *discipline*.

It is also notable that your Association brings new opportunity and obligation for you *as a body* to cooperate with others in learning the factors and influences—near and far—which now restrict and retard biology from taking its rightful and necessary place in the education of our people. Both as individuals and as groups you can give consideration to these questions and—in due time and in proper place—you will have opportunity to set your findings before the Committee on Biological Science Teaching which today—when you assumed membership in the Union of American Biological Societies—became in effect your own Committee. In connection with this matter of fact-finding it should not be forgotten that as yet no one has anything much better than an *impression* as to which are at present the chief restrictive factors and influences upon biological teaching in the public schools of the United States.

Five Minutes of Shop Talk

Before proceeding with the main theme of this address I ask your permission to say a brief word about certain practical and immediate things concerned in classroom teaching that will doubtless be improved through the efforts of your Association and its Journal. It would be

perhaps presumptuous for me to enter deeply into the many items of that large subject. I venture merely a short statement concerning four items on which I have a considered opinion and much interest.

Item A. One may hope that your new and fast-growing organization will direct effort toward hastening the day when *illustrative* material will accompany all biological teaching. Everyone knows that both live and dead material, specimens, charts, models, sketches and other tangible or visible devices are variously usable. But the point your organization may well stress is that biological topics—objects, functions and principles—require very free and full use of visual aids, *i.e.,* aids other than textbooks, if such instruction is to have high value as science teaching. Parenthetically, it could be noted, with a great sense of shame, that even in our colleges and great universities there is still frequent pretense at teaching biological subjects nearly or wholly without use of these commonest and most necessary visual aids.

Item B. May you exert effective pressure for a diminution of the use of *technical terminology* in secondary school biology! This plea is made in the interest of both a punished school population and a wounded science. It is a commonplace observation that a tortured memory is far too often the most lively acquisition of a high school pupil from a so-called term of biology. Often and obviously the real message of our science is buried beneath words.

Item C. The biology teacher is, or should be, charged with giving young and immature minds an insight into the processes and basic facts of reproduction and sexuality. Such instruction is of high interest and importance at that or a still earlier time in the life of a child. But it is probably even more important—both to the child and to the place of our science in public education—that this instruction be given with all the consideration, dignity and delicacy demanded by the recipient child, and likewise most fitting for those profound and really majestic chapters of our science. Over a period of years I have questioned mature persons concerning their reaction to their high school instruction on these subjects. It is found that a considerable proportion of these people were distinctly offended, or were otherwise unfavorably affected, by something relating to the manner or extent of the presentation of these subjects in the secondary schools. Surely our science instruction should serve all the pupils subjected to it; and our science greatly needs to make many friends, since the place of our science in education depends largely and ultimately upon the public. That teacher whose English vocabulary is too restricted to present these subjects inoffensively should burn much midnight oil or return to college; and that high school teacher who cannot teach these aspects of biology acceptably is a doubtful asset to either biology or education. The editors of your Journal will perform a valuable service if they recurrently obtain and publish articles dealing fully and suitably with this topic.

Item D. As the last of these items I simply repeat a thing which apparently cannot be said often enough. Above all other things, teaching in the life-sciences should deal with principles, perspective, the living world around and within us, and with personal experience with the

scientific method. It seems that now as never before these central aims should be pursued; and both opportunity and obligation fall anew and with increased force upon this Association to advance those good ends.

Before proceeding with more serious things let us consider for a moment whether other agencies than the school can provide the citizen with an acceptable training in and comprehension of the life-sciences. In this connection one thinks especially of the printed word and of the radio. Indispensable as are the newspaper, magazine and book in the lives of men every biologist knows that they have failed and now fail to mirror the texture and fruit of life-science only less completely than they fail to instruct in the procedures of arithmetic. But probably this is less a reproach to our public press than to our popular education; if appetites were developed it is probable that the press would supply nourishment. Indeed this is indicated by a recent count which showed that 256 American newspapers carry *astrological* services—and our people, like all others, have much appetite for myth and magic. Nevertheless, a few dozens of newspapers now perform a real service in their suitable presentation of *scientific* news; their numbers and influence will doubtless grow, though indeed at present most newspapers seem more interested in presenting the new thing as sensation than as science. Only a public mind already trained and "appetized" is likely to be much shaken by the life-science output of the nation's press.

Radio—an unequalled means of general communication among large groups of men—has developed in a generation unprepared by education to use it to feed or to sustain the intellect. You can make a test of this at almost any time. Plug into the air and you find this hitherto usually friendly canopy of earth stuck through-and-through with flat-eyed crooners, commercial pleaders, rehearsing demagogues and heedless jitterbugs. If the radio is to become of much service to the best in man we must first develop truly intellectual interests in a greater proportion of our people through real and solid education in our schools.

Much Vital Subject Matter and Many Impediments to Learning

For purposes of this presentation the broad scope of our science, and the inherent difficulties of presenting it adequately to our people, may not be either overlooked or minimized. Let us now consider certain aspects of that group of problems. Grant for a moment that many of the thought-transforming principles of life-science urgently need to be brought, through general education, into the lives and consciousness of our people. Grant, too, that only the primary and secondary schools of a nation have opportunity thus to train the masses in life-science or in any other subject. Then, against a background of urgent need let us for a moment consider more specifically how current educational practice and extra-curricular forces deal—or restrict our dealing—with life-science in the education of our young people.

In our *primary* schools it seems obvious that there is little taught that even breaks the skin of the ripe apple of life-science. There is indeed occasional classroom consideration of an object or structure that is or was alive. Also, the names of a few plants and animals, typically with accent on the *wonder* of the performances of some of them and upon the *beauty* of others. We leave it to you, or to the

members of any group of educated men, to estimate the chances a diligent pupil now has during his first 6 or 8 years in school to hear anything about, for example—the rule of natural law throughout the living world—the animals as our own ancestors—the man of 500,000 years ago —or the inevitable inequalities of human beings?

Not only are mind-arousing things touching the origin and destiny of man withheld from the alert minds of childhood during the period of their keenest curiosity, but the subterfuges supplied in their stead—together with continuous drills of memory and absence of the joys of thought—sooner or later succeed in *anaesthetizing* the better functions of the minds of our boys and girls. Your speaker is quite convinced that this anaesthesia is now practiced wholesale and effectively in nearly all of the primary schools of this and practically all other countries. The healthy initial interest and the fine curiosity with which human beings are born will usually not survive 6 or 8 years of schooling where basic questions are answered in terms of magic or of the unapproachable supernatural. Most inquisitive minds thus buffeted and stultified will find nothing better to do than to go to sleep.

I submit that I know of nothing in the sphere of biological things that approaches in importance this situation in which our schools turn out a generation of minds dulled to the best of science, though that generation must live in an age shaped by science and though that generation is called upon to make momentous decisions on the complex social adjustments imposed by application of scientific discovery. Freedom of thought is a prime condition of a democratic and progressive civilization. Yet our primary schools are without this freedom at all points where life-science touches the basic questions as to the origin and destiny of man. These questions have been so long identified with "religious" questions that the great majority of our children are not permitted to discover what the questions themselves mean, to say nothing of giving them access to the results of rational scientific attempts to solve them. From this standpoint it is most interesting to reflect that—except perhaps for a little while in ancient and magnificent Greece—no one has yet had opportunity to see a single generation of human beings develop without the repressing influences on free inquiry which religious tradition throws around these basic problems of life-science.

Concerning the past and present position of the life-sciences in our *secondary* schools I can here say only a single word, but I would rather have that word heard and considered by teachers of secondary school biology than any other thing I am capable of saying to any group. The slight place of biology in the present secondary school curriculum just now seems in greater danger than at any previous time in our generation; it is being subjected to a revaluation and to destructive pressure both from above and below; this danger varies much among states and localities, but it is rapidly spreading. Unless our teachers of high school biology soon find means of bettering, sustaining and extending their biological teaching they and our people will suffer real losses which may be irreparable during our generation. The fending of this threat and the securing of an enlarged place for the life-sciences in the instruction of our people constitute the basic reason for the existence of this National Association of Biology Teachers.

Prof. John Dewey recently said: "We have broken with the intellectual traditions of the past and the mass of men have not had the nature of the change interpreted to them." This audience knows, and all men charged with the education and intellectual leadership of a nation should never forget, that it is and has been the great educational opportunity of today and of the nearby yesterday to bring this intellectual climate to the many who come for education to our schools. And biologists cannot forget that those developments which have been most conspicuous in "breaking the intellectual traditions of the past" lie within or quite near their own field of life-science. From here has come much new evidence that life itself was evolved from the non-living and that one living species is slowly transmuted into another under natural law.

Biological research has given us indications of still other principles of much significance in the thought and life of man. Probably neither structural changes in man nor changes in the chromosomes and genes carried by him adequately account for the striking changes that have occurred in man during the last 20,000 years. It is fairly evident that those changes in man came largely from external *social forces* born with the discovery of fire, the extension of agriculture, the domestication of animals, the invention of alphabets and wheels, and the use of metals and harnessed energy. These same external things—earliest products and by-products of science and shared by all—brought greater security, plenty and leisure, and they also supplied the foundation for written language, accumulated experience and able leadership. No human being thereafter grew up as his mere primate self; from infancy onward he was permeated by much that his race had already accomplished—a thing not possible to any other living species, and a thing scarcely discernible during the first hundreds of thousands of years of primitive man himself. Not only do these principles supply foundations for *social science;* they equally indicate that the quite comparable thing we call *education*—real education—may even now be capable of giving a further and important lift to man.

Continuing this glance at the broad scope of our subject matter, and inherent difficulties in presenting it to a people, we next recall that we now preserve very many of those who were automatically lost in the gruff struggle for existence during and preceding those primitive days when man gathered his basic strength. No optimum of future man is thinkable without some selection and control either of those permitted to live or of those permitted to reproduce. Men may as well make up their minds that neither magic, tea-leaf reading nor prayer will suffice for checking this physical degeneration of the race.

Again, the young life-science we call genetics has shown us that a single gene can produce feeble-mindedness. In this case we observe not only the closest possible nexus of body and mind, but also that mental development is dependent upon the same pill-box of genes that decides the color of our skin or our degree of resistance to diabetes. Further, it has given us another politically important fact about ourselves—namely, all men (except identical twins) are created *un*equal. After pausing to remind that the inequality of which we speak is individual, not racial, we ask: Who will tell us how essential it is to have this clean fact assimilated and well known by the public at

large in order that democracies may avoid the unreason and the extremes that may destroy them?

The Broader Opportunity and Obligation

Science has shaped our civilization, but scientists have not assumed responsibility or leadership in it. Condensation (of original address) permits only mention of this subject here. Men now begin to feel that we are entering a socially-minded age; but only a few begin to see and say that democracies may obtain more of chaos than of comfort if their peoples are left unacquainted with realities and with the forces impelling social change. Only dictatorships can blacken out the sphere of reason and still avoid immediate chaos. Indeed, the very principle of democracy is already in the midst of a grim and cruel struggle for survival; and yet our educational programs nowhere now support freedom and democracy as civilization itself demands. In my opinion it is in connection with this threat at democracy and civilization that this Association, like any and all other groups concerned with science or education, will find its supreme opportunity and its supreme obligation.

In conclusion: Several years ago when Charles W. Eliot, the chemist, was president of Harvard University he said: "The human race has more and greater benefits to expect from the successful cultivation of the sciences which deal with *living* things than from all the other sciences put together." In the years that have followed that statement, the life-sciences have increasingly become not only a great treasury of vitally important knowledge, but an interpreter of man, and the source of a method of learning how men may live together. The values it brings to man through some of the technologies—medicine, sanitation, agriculture, husbandry, and the rest—will in part reach, affect and aid the masses of men whether they will it or not. But its greatest benefits to man—particularly in a democracy—can be attained only when its simple and basic principles and methods have become the possession of the average citizen; and only primary and secondary schools can really bring those things to the average citizen. Too, these greatest benefits follow upon man's placing himself upon a basis of reality, with reliance upon the scientific method which has reshaped his world and which has made him both powerful and comprehensible. Though these supreme things are attainable through an accent on science in our educational program one finds we now merely touch with a finger where we should grasp with a hand. Precisely here the always halting steps of mankind urgently need support. This Association comes into existence with unusual opportunity and a pressing obligation to serve a nation, a science, and a new and higher state of man.

Notice

BACK COPIES

Due to the rapid growth of our Association during November and December it is possible that a few members have failed to receive one or two copies of the journal. There is available a small supply of the first three numbers of our journal. These will be sent to members who failed to receive their copies, as long as the supply lasts. All requests for back copies should be sent to P. K. Houdek, Secretary-treasurer, Robinson, Illinois.

A Simple Micro-Viewer

PHILIP GOLDSTEIN
Walton High School

Under handicaps such as large classes, the necessity of covering a full syllabus, and frequently inadequate equipment, teachers are often forced to use demonstrations in lieu of individual microscope work, although they, and the pupils too, would prefer the latter.

I, myself, spent five years teaching in an annex equipped with only two microscopes. Naturally, it was necessary for me to depend entirely on the demonstration method for microscope work. In spite of the fact that I used any number of devices to try to make the students see those things I wanted them to see, I never felt confident that what was so clear to me, was at all apparent to them. On innumerable occasions, a glance at the microscope after five or six students had looked, showed me that the object they were supposed to see was no longer in focus, or that the slide had been moved. Yet, almost invariably, the last student who had looked maintained that she had seen clearly whatever it was the class was supposed to be studying (even though I had made drawings, cut out pictures, asked questions, and given instructions to guide their observations).

Particular difficulty was encountered in demonstrating live protozoa such as the paramecium. Slowing them down was not always enough. Frequently I would find a student admiring the beauties of a fiber of lens paper or an air bubble, or a rotifer, in the fond belief that she was looking at a paramecium, long after the last ciliate had departed from the field of vision.

What to do about this situation? The microprojector is a possible remedy. But it has several disadvantages, not the least of which is that many schools do not own one. There is no simple piece of apparatus available which can be used as a substitute. Hence the only solution is to "invent" something.

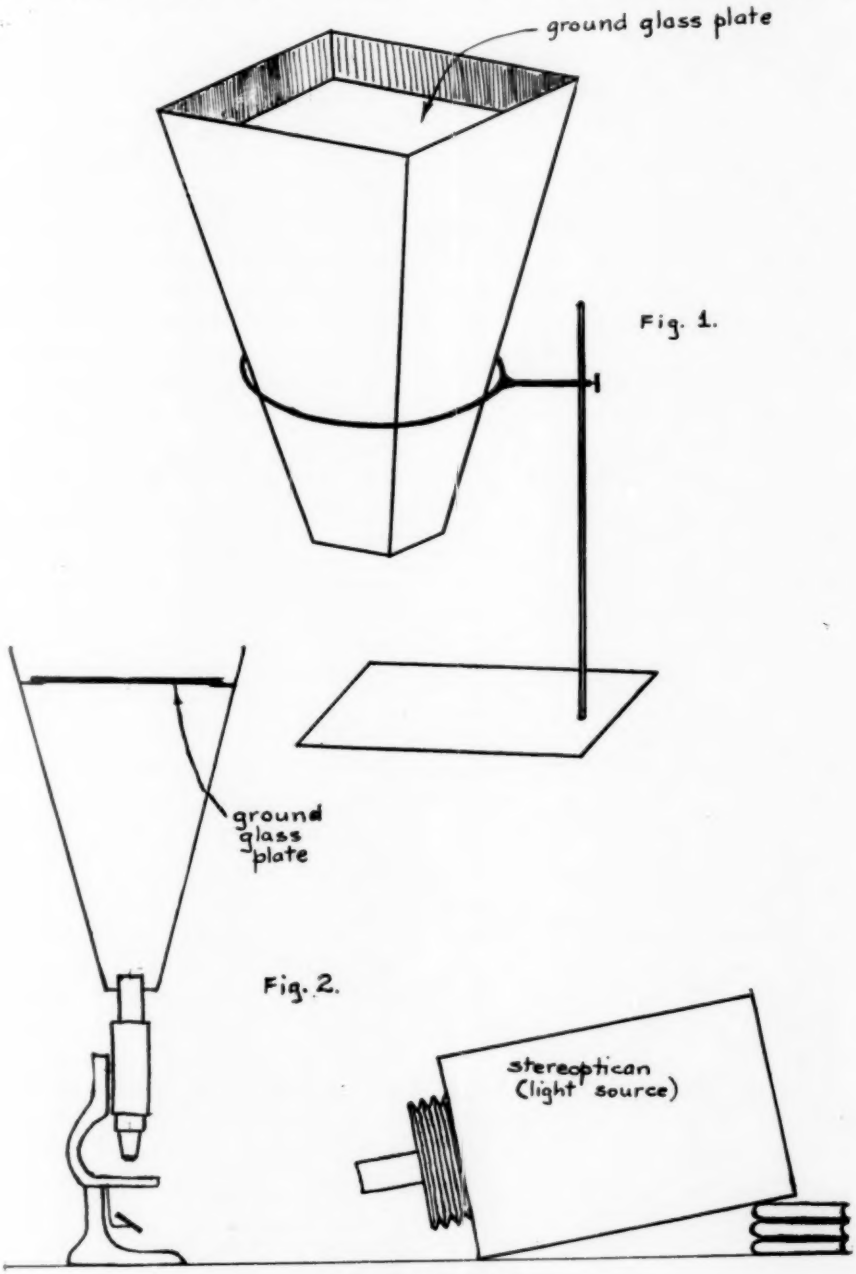
The "invention" proved to be simpler than was expected because the image seen through the microscope is really projected to any level above the ocular, depending on the strength of the illumination. This fact is used in photomicrography where a bellows is set above the microscope and a photographic plate is exposed at the point of focus. If in place of the photographic plate, a translucent screen were put at that point, the image should appear on the screen.

Therefore, the "invention" consists of a cardboard box (instead of a bellows) in the form of a truncated square pyramid (see Fig. 1) with a ground glass on a platform built about two inches below the upper (broader) end. The narrow end of the box is just large enough so that it can be lowered over the draw tube of a microscope, where it is supported by means of a ringstand and a large ring (Fig. 1). A stereopticon is used as a source of illumination, and the apparatus is arranged as in Fig. 2.

After preliminary practice by the teacher on various materials, the device was used to teach the structure of the plant cell to two classes in general biology. The students were asked to bring their textbooks to class, and they were

assigned readings at their seats dealing with cell structure and history. Meanwhile the teacher set up the apparatus (see Fig. 2), and the front shades were drawn leaving enough light for reading but preventing the outside light from falling on the ground glass screen.

About six students were called up at a



A simple micro-viewer

time. They grouped around the micro-viewer, and the teacher explained, pointed out, asked or answered questions as was necessary. (A dissecting needle makes a good pointer.) These students were then asked to return to their seats and draw what they had seen, and another group was called up.

It took two periods to show four slides (fresh onion epidermis, stained onion epidermis, plasmolyzed onion epidermis, elodea leaf), but at the conclusion of the second period I felt certain that every student had seen every structure of a plant cell, as well as the movement of the cytoplasm in the elodea leaf. This was something I had never felt before.

Mrs. Winner, the head of the department, who came in during the second period, recommended an improvement which was adopted in subsequent lessons. Her idea was to have additional microscopes set up to which the students could refer after they had seen the demonstration under the micro-viewer.

Since then, the device has been used successfully to demonstrate spirogyra, protozoa, and some tissues. Occasionally things happen which point out additional values. For example, in one class, I was able to demonstrate to every student the action of the contractile vacuole and the canals of a paramecium. It is true that if one knows what to look for, this action can easily be seen under the microscope. But how many of our students are capable of locating and observing it independently?

There are many difficulties associated with the use of this device. Some of these may be eliminated by improving the device itself; others are inherent in its use. Chief among these difficulties are:

1. It is time consuming. It takes longer to set up and use this type of demonstration than to set up and use a whole series of demonstration microscopes. But, on the other hand, it has the outstanding advantage of certainty in regard to what the pupils see.

2. Securing good light is difficult. The arrangement used (Fig. 2) is probably not the best. The light spreads, and some reaches the screen indirectly, taking away from the distinctness of the image. It would be ideal to have a pencil of very brilliant light, which could be directed so that it strikes the mirror only, and does not reach the screen in any other way.

3. The box holding the screen is not very stable in its present state. Some means must be devised for attaching it more firmly to the ring stand.

In conclusion, it seems to me that in spite of its disadvantages, the micro-viewer has its uses, particularly where equipment is meager. Its simplicity and ease of construction make it doubly valuable.

CHARTER MEMBER CERTIFICATES

The Executive Board has approved the issuing of certificates of charter membership if there is sufficient demand to warrant the printing of such certificates.

Arrangements can be made to issue an individually printed and framed certificate of charter membership postpaid for one dollar. Charter members may place orders for certificates with P. K. Houdek, Secretary-treasurer, Robinson, Illinois.

Any member whose original membership covers the entire period from July 1st, 1938, to June 30, 1939, is considered a charter member.

A Handling of the Topic: Cheese

EDITH A. PURER
Herbert Hoover High School, San Diego, California

In such a wide and interesting field as botany the development of topics pertaining to the subject may be varied. A different approach, which has experimentally proved its worth, is suggested here. It inferentially fosters the hope that other botany and biology instructors having "pet" or favorite methods may feel inclined to present them and make them available to all.

An attempt in that direction was made in the study of bacteria and molds in relation to the flavoring of cheese.

In certain cities there exists an opportunity to visit a cheese factory, an opportunity which may provide an interesting and helpful experience. In the absence of this advantage, there always remains the scheme of substituting samples of cheese brought into the classroom by members of the class.

The preparatory step (about a week before the time for the proposed project) would be to question the pupils along such lines as these: Do all cheeses taste alike? Have you ever tasted or eaten Limburger cheese? Considerable excitement is thereby aroused, as well as real interest in the subject.

A committee is elected in each class whose task it becomes to organize the work in order that a better understanding of the subject under discussion may result. Some pupils may volunteer to bring small samples of various types of cheese; others may provide favorite kinds of crackers. Articles on the subject will be sought. One company furnishes a very attractive booklet dealing with the history and manufacture of cheese, a booklet which meets with prompt and eager demand. Students promptly sign up for reports on specific classes of cheese. (With large classes almost invariably the supply of subjects on which to report proves inadequate.)

On the day selected as "cheese day" all the cheeses are labeled and placed on the demonstration desk. After the close of each report on a particular brand of cheese, the girls and the boys form in line, each taking a cracker and a sample of the cheese just reported on.

Not only are the historical backgrounds of the cheeses given, but also a brief account of the process of the manufacture of each is dwelt upon, inasmuch as it may essentially differ from other such products. In addition, the fact whether the sample in question has been flavored by the action of bacteria or of mold is made clear. The difference between cheese as first made and the process type is explained. Its table use in one form or another brings a correlation with the domestic science department.

In quite a number of cases, this project offered the first opportunity to the young people of sampling the various types of cheeses and of comparing their flavors. The great variety, the difference in flavors, the varying qualities of this product impressed many.

Needless to say, parents become as pleasantly interested as the pupils, and the comments on the procedure are gratifying. Visiting graduates invariably ask about "the cheese day" and it has become one of the interesting and established practices in these botany classes.

Biological Briefs

RUTH SHERMAN

TROUGHTON, ELLIS LEG.

Australian Mammals: Their Past and Future.

Journal of Mammology **19**: 401–411. November, 1938.

After their segregation and subsequent specialization, the Australian marsupials remained fairly stable as to population even after the introduction by the aborigines of the placental dingo dog. Since the advent of white population within the past 150 years, however, their numbers are being fast depleted. Clearing the land for stock and crops and destruction of vast areas of vegetation by fire have removed shelter and food resources. Man has attacked marsupials with poisons, guns, and traps; while his importation of rabbits, foxes, and cats has resulted in enormous destruction of native forms. At present, of more than 50 original species, five are extinct and 16 nearly so. The author pleads for adequate coördinated programs in game conservation, citing the great but almost unrecognized economic value of the marsupials in destroying insect pests, plant parasites, and small herbivores. The entire article is of much value in studying the history of animal populations, and in comparing Australia's conservation problems with our own.

STEVENS, NEIL E.

Departures from Ordinary Methods in Controlling Plant Diseases.

Botanical Review **4**: 429–445. August, 1938.

The commonest practices for controlling plant diseases have been known and utilized for a century or longer. Within recent years, special methods of disease control have developed. Fruits are being wrapped in mineral oil-impregnated papers for the prevention of storage rots and fungal growths; success has also been obtained by storing fruits and vegetables under low temperatures in carbon dioxide gas. Heat treatments, usually by hot water or steam, have been found efficacious in freeing seeds, bulbs, and some buds of fungi. Yearly alternation of acid and alkaline soils is of occasional benefit. Trenches containing a mixture of soil and heavy oils check the spread of root diseases. Conifer seedlings were found to resist stem girdle when planted leaning towards the south, so that they shaded their own stems.

HARDY, A. C., AND MILNE, P. S.

Studies in the Distribution of Insects by Aerial Currents.

Journal of Animal Ecology **7**: 199–229. November, 1938.

Using oceanographic technique, a study of the distribution of insect "floaters" (aerial plankton) was made. Insects in this category are small, light-bodied forms with relatively large wing surfaces but weak powers of flight. They were taken in trap-nets at heights of 150 to 2,350 feet, although few occurred above 1,000 feet. They were most abundant in fairly high temperatures and low humidity. Their occurrence correlates with the flight of insectivorous birds. The study also emphasizes the importance of

convection currents and wind drift in distributing insect pests as far as 150 miles from their point of origin.

RICKETT, H. W.

A Course in General Biology.

School and Society **48**: 688–692. November 26, 1938.

How can present-day biology, with its mass of data and facts be made agreeable to the average undergraduate? Mr. Rickett feels that the answer is not to be found in the average "survey" course with its rapid and quite superficial treatment of the entire field of Science. Nor does he feel that the standard course in which emphasis is placed on the accumulation of much information of a doubtful value to the student in after life meets the situation. In his own courses he has developed a technique of giving what might almost be called "samples" of biology subject-matter, this sampling being of such a nature that the student was not given material beyound his grasp nor material which would be irrelevant to his future activities. A mixture of anatomical dissections, physiological experiments, and taxonomic work attempted to give the student a grasp of the fundamental concepts of biology. While not extensive in its scope, the author feels that "what they (the students) knew they knew well."

STICKLER, W. HUGH.

High School Biology in the Panama Canal Zone.

Secondary Education **7**: 186–189. November, 1938.

To anyone planning to work in the tropics, this article will prove of real value. Humidity, a factor of the environment with which we of the north have little trouble, is one of the most troublesome things with which a biologist must contend. It plays a rôle not only in the preparation and preservation of specimens but also in the keeping of chemicals and even books. Glue that would be perfectly satisfactory at home softens, fungi grow on everything, and what they do not injure, insects of myriad forms and ferocious appetites devour. Not only does one have difficulty with these materials, but the forms which are available for class use are quite strange and texts which are of use in the temperate zones must be changed to meet the new conditions found in the tropics. To offset some of these disadvantages, there is the fact that new forms are encountered here which are interesting to the teacher and lend themselves admirably to use in the laboratory and class room.

BOLIN, ROLF L.

Reappearance of the Southern Sea Otter along the California Coast.

Journal of Mammology **19**: 301–303. August, 1938.

The article reports the reappearance of a valuable fur animal long considered almost extinct. Scattered herds totaling about 150 individuals have been sighted along an unfrequented portion of the coast near Monterey, California. A state game warden has been appointed to keep the animals under strict supervision, to aid as much as possible in restoring their numbers. (The seal and sea-otter fur trade played an important rôle in the settlement of northern California by Russian colonists during the first half of the nineteenth century. The resultant uncontrolled slaughter added its chapter to the annals of wild species decimated by man's attacks.—Ed.)

Editorial Comment

LOCAL AFFILIATES VS. THE NATIONAL

Out of its swaddling clothes in six months is the meteoric rise of the National Association of Biology Teachers. During this brief time machinery has been perfected where by the association is regulated by a constitution and by-laws and an executive board. The official organ "*The American Biology Teacher*" is on a high plane of journalistic achievement capable of challenging its readers with the latest developments in the field of biology.

The next step of the association is to perfect a group of virile affiliated chapters. Several local biology groups have been functioning for years. Others have organized in very recent months due to the stimulus of the organization of the national, a few more are contemplated for the near future or with slight encouragement could be conveniently organized.

According to the constitution and by-laws of the national, local chapters may affiliate with the parent organization. At the Richmond, Virginia meeting in December twelve local chapters petitioned the executive board for such affiliation. This group of petitions was granted. There is also provision for the voting and collection of national dues by the locals. Chapters requesting this service are also helping to unite the local and national in stronger ties.

There are several ways the national can lend assistance to the locals. First, the officers of the national association are always willing to give freely of their time and effort to take part in their activities or appearing on their programs, and making suggestions if they are asked for the information.

Second, help may be secured in formulating a constitution and by-laws for the chapter. Third, aid for local membership drives can be secured thru the national by writing Miss Lucy Orenstein for plans of procedure. These plans are workable because they are the result of her efforts in securing New York memberships. Her suggestions no doubt will be of value to the chapter group. Fourth, Dr. Miller is ready to aid in securing any new prospective members in your area that have not already been contacted, and has funds available for the purpose. This service is free of charge. All the local needs to do is to mail him a list of the new prospective members and they will be circularized through his office.

There are numerous ways in which the locals can help themselves to attaining a prominent place in the educational system of their area. First they can be of service to the individual teachers and second they can aid the teachers as a group.

Service to the teachers as individuals includes the distribution of free literature or that obtained at a nominal fee, and cultures of living materials as daphne, protozoa and the like. This distribution to be made at the regular meetings. They can also aid the individual teacher by having practical well planned field trips in the area staffed by an enthusiastic field trip faculty.

Services to the teachers as a group take the form of a constructive study groups. This provided the problem selected is not too large, direct in its application, and of sufficient merit to be worthy of investi-

(Continued on page 140)

Biology Teaching Aids

TROPICAL FISHES IN THE CLASSROOM

For the past few years, the hobby of rearing small tropical fishes has become a popular one, and many school rooms and homes possess one or more aquaria containing a brilliant and varied assortment of these small fresh-water exotics. Their habits often differ as much as their appearance, so that breeding and observing them offer rich opportunities for study.

Many species, such as angel-fish, zebra-fish and other Danios, tetras, and Siamese fighting-fish, while beautiful, are somewhat difficult to maintain and breed. For the novice without elaborate equipment, the live-bearing members of the semi-tropical Cyprinodont family provide a hardy, prolific type of aquarium denizen which may be utilized in a variety of teaching situations. The family includes platys (or moons), sword-tails, mosquito-fish, mollies, and guppies.

The guppy (*Lebistes reticulatus*) is a most interesting member of this group. It is quite hardy and in milder climates may be kept throughout the year without artificial heat. Where winters are more severe and the fish are kept in a room unheated at night, an inexpensive thermostatically controlled electric heater may be purchased from aquarium supply houses to maintain a constant temperature of 72–78° F. With the addition of a few healthy fresh-water plants, such as valisneria or fox-tail, and snails for scavengers, the fishes may be easily maintained in a balanced aquarium of one to ten gallons capacity. They thrive on a diet of dry prepared tropical fish food, with the occasional addition of scraped raw liver.

In appearance, the male guppy is the smaller and more brilliantly colored, exhibiting spots and streaks of red, orange and black, and areas of blue and green iridescence. The female is larger (seldom exceeding one and one-half inches in length, however), less active than the male, and is of a more uniform gray ground-color without the male's brighter patterns.

The several types of pigment-cells, or chromatophores, may be easily demonstrated by killing and fixing the fish for four to eight hours in ten per cent. formalin, removing the skin and mounting it on a slide in glycerine after a short stay in water to remove most of the formalin. The mount may be made more permanent by sealing the edges of the cover-slip with vaseline, paraffine, or thick Canada balsam. The black chromatophores (melanophores) which outline the scales in both sexes and form the black portion of the male pattern are of particular interest, appearing under this method in their extended condition in a stellate or daisy-like form. If the fish has been killed by hot water or by decapitation, the melanophores are greatly contracted, and the general skin color is much lighter. This may serve to illustrate the mechanism of color adaptation to light and dark backgrounds, which is common in several groups of small fishes. Yellow xanthophore cells and guanin crystals which produce iridescence may also be observed in these preparations.

In breeding habits, the guppy is ovoviviparous. Fertilization of the eggs is internal, the sperm being transferred by means of the modified pencil-shaped anal fin of the male. The courtship of the males may be frequently observed, as they hover before the female with fins outspread. The females will produce broods of from three to thirty live young at twenty-eight-day intervals, the sperm from one mating lasting for as many as eight subsequent broods of young. If allowed to remain with their parents, the fry should be given floating green plants in which to take refuge from their cannibalistic elders.

Because of these breeding habits, the guppy offers an interesting study in life history. The testes, a pair of milky white glands situated on either side of the body above the anal fin, may with only a little practice be removed from a freshly decapitated male, or one which has been anaesthetized in a very weak aqueous solution of chloretone. When crushed under a cover slip on a glass slide in a few drops of Ringer's or normal saline solution, the testes liberate millions of sperm, which will remain exceedingly active for as long as ten minutes and which may be easily observed under high-power magnification. Likewise, the single ovary and oviduct may be removed from the female, to show immature and mature eggs (the latter very large), and embryos in various stages of development. The embryos may be cleared and mounted in glycerine, if desired.

If food and temperature conditions are favorable, enough generations may be reared during the course of a year to provide an interesting study in genetics. Strangely enough, most color factors are sex-linked, as are color-blindness and haemophilia in human beings. As in *Drosophila* and human inheritance, the sex chromosomes are alike in the female (XX) and dissimilar in the male (XY). Unlike *Drosophila*, however, the Y-chromosome can, and frequently does, carry genes for color patterns. In most cases, the patterns show only in the male, because of the drab female coloring; but females nevertheless transmit their X-chromosomes to both sons and daughters. From preliminary research by the author, the variety known as the "golden" guppy appears due to one or more non-sex-linked recessive characters, and hence may be used to illustrate simple Mendelian inheritance in crosses with the dominant wild-type gray variety.

To summarize, then, we may say that the guppy is an easily reared fresh-water fish lending itself to studies in balanced aquaria, coloration, breeding, growth, and genetics. After some experience with this commoner species, the class may wish to handle other types of tropical fishes with even more interesting life histories.

Ruth Sherman,
Los Angeles, Cal.

Exchange Service

J. L. Sloanaker, 1117 Maxwell Ave., Spokane, Wash., can supply lantern slides of birds, also chemistry and bird magazines. Wants—file of Science Education magazine, which succeeded the Gen. Sci. Quar. in 1931.

L. N. Kolste, Milan, Wash., would like to exchange a set of 35 Hunter's Biology for a set of Moon and Mann.

The Still Camera in Biological Presentations

LORIS C. OGLESBY
Head, Science Department, Atascadero Union High School, Atascadero, California

Much has been written at one time or another on materials for the presentation of biological material to the high school class. The author has found very little mention of the camera as a method of presentation. Visual education comes in for its share of attention but the term connotes purchased or rented material made up by someone whom the teacher and his class do not know and have never heard of.

It is not the purpose of this article to minimize the importance of visual education material, but it is the purpose to open up a new field for the biology teacher—a field that is limited only by the teacher himself, his initiative, ambition, time, and money available.

The use of the still camera by the teacher to aid *him* in *his* problems of presentation is the major theme of this article. What may be problems to one teacher are easily solved by another, and yet, no matter how effective a teacher is, he can always be more efficient. It is with the thought in mind of opening a new field for those teachers who have not thought of it before and to give the teachers who have used these methods some new ideas that this article is written.

The still camera is plastic—probably more plastic than the moving picture camera and certainly cheaper to operate. Skill in making good stills comes somewhat easier to most people than in movie work. Anything that can be taken with a movie camera can be photographed with a still camera, and many things that could not be reproduced by the movie can be by the still. The still camera has the advantage in that it does not require a series of related subjects to photograph. One picture may be all the instructor would need to illustrate a point but in movie work it would require at least a fifty foot roll of film which would run through the projector so rapidly that the students would not have time to digest the material by the time it was all over. Too, the technique involved for movie making and projection is much more involved than for the still camera.

The methods of photography are covered so thoroughly in many publications that it is not necessary to go into the technical details here. There are few people who have not had contact with a camera in some form or other, but there are only a comparatively few people who have so completely mastered the camera that they know exactly the results that will be achieved before exposing the negative. The teacher who wishes to make his camera give him material aid in his teaching must master the instrument. The more good photographic literature he reads the better mental equipment he will have to make good pictures of things that he really wants to show.

The equipment needed is a camera and a slide projector with an adapter for the size of the slides of the camera. If a 35

mm. camera is used a positive transparency can be made from the negative and then each frame can be mounted in glass instead of having the added expense of lantern slide material as needed in the larger cameras. A word of caution is needed here. The slides will be no better than the projector makes them, so it is poor economy to save money when purchasing a projector.

After a teacher has decided upon the type of picture he wishes, he can decide upon the camera. The modern miniature camera is probably the most versatile of all. Color film can be used in them as well as the black and white, and the expense of operation is cut to a minimum. Each frame can be mounted in glass for lantern slide or else the whole length of film can be left and projected as such. There is no question as to the advisability of projection. Besides allowing the whole class to view the image at one time the pictures take on a new meaning when projected to large size and viewed at a little distance. With a good projector and a good screen the slides can be projected with reasonable efficiency in a fairly light room.

There are many different priced cameras on the market, but to the teacher who is not photographically minded, it might be well to learn to master a cheap camera before going into the highly precise instruments which are advertised in practically every magazine. A camera is a piece of scientific equipment, and, if the user regards it as such and himself as a scientist, good results will be assured. The camera consists of a lens, a shutter, and a diaphragm. Each was made scientifically and together they must be used scientifically. The camera is capable of producing good pictures if the user is capable of taking them.

There are many reputable photographic finishers who will process the film and make slides for a reasonable sum; however, if the teacher is a photography enthusiast much of this work can be done by him or his class. Added interest is taken by the students if they are allowed to aid in the preparation of some of the material.

The slides, once made, are permanent and can be put in a permanent slide library which can be built for the whole school, no matter how large.

The uses of the camera in the presentation of biological material are so many that it is impossible to mention more than a few of them. Nature study and nature appreciation are the things one thinks of at first, but there are many others. Human anatomy and physiology can be presented with the camera as well as a survey of animal and plant life. The author has made several microphotographs of cell division and these, coupled with pictures of diagrams, have aided immeasurably in the presentation of mitosis and meiosis.

Nature study and appreciation certainly should come in for major consideration in any functional course in high school biology. With our present-day transportation there are few teachers who could not have interesting and valuable summer experiences which could be recorded on color film and later made into glass slides. The number of biology classes which cannot take field trips is tremendous. In lieu of field work a series of color slides would do wonders to stimulate interest and a desire to learn within a group of students.

All biology teachers who are worthy of the name are lovers of nature and all nature means. To bring nature to the class room is a problem that only a few have solved. "Canned" visual education is better than nothing but the teacher can put life, interest, humor, and color in lantern slides that he, himself, has taken.

There are few places in the United States which are not within a few hours automobile drive of natural beauty. There are few places outside of the cities which are so completely civilized that all wild life has vanished. Initiative and patience are all that are necessary to make a series of marvelous nature slides.

The uses of the camera within the laboratory itself are tremendous. Microscopic life, stained and prepared microscopic slides, diagrams, and charts all lend themselves to the camera. Most of the better 35 mm. miniature cameras can furnish a microscopic attachment, but, if the camera maker doesn't make an adapter, one is easily made with a ring stand, clamp, and a piece of black paper. The ring stand and clamp are used to hold the camera and the black paper to exclude extraneous light.

Diagrams lend themselves very nicely to picture taking provided that the diagrams are inked on white paper with lines sufficiently large to show well. The author had the privilege of taking an advanced course in cytology, and the drawings made of mitosis and meiosis proved very satisfactory for class room use. Most teachers by looking back through their college laboratory material will find ideas if not subject matter. A few of the many diagrams that can be drawn and photographed are Mendelian heredity, osmosis, stem structure, reproduction, photosynthesis, respiration. There are many others but these few may give some ideas as to what can be done.

It is not believed that any class has enough charts. This may be due to any of several reasons with expense probably being the major item. Room for these charts plays a very important part. Charts are easily photographed in color and, once photographed, they take up little room and the expense is cut to a point where the average school can afford them. Care must be taken that no copyright laws are violated when photographing charts for classroom use.

A teacher's own experiences, his thoughts and reactions are the motivating forces in the class room. The author has found no better method of presenting these than through the camera. The camera, if recording the teacher's own experiences, gives him a chance to add the necessary human interest to make a biology course alive and functional.

REQUEST FOR COURSES OF STUDY

Ross Clover of San Juan Union High School, Fair Oaks, California, would like to receive unit or lesson outlines for year courses in biology from teachers throughout the United States. It is desired that the topic sequence for the entire school year be given, together with the reasons why such an order is followed. Information on the location and size of the school and on community industries would be very helpful. A survey of such material would give some idea of the relative popularity of biology courses presented through the "types," "principles," and "systematic" approaches. The data received will be summarized in the AMERICAN BIOLOGY TEACHER.

Suggestions for Laboratory Work in Bacteriology for High School Students*

CURTIS M. HILLIARD
Professor of Biology and Health, Simmons College

Bacteriology is a live and growing subject. It has many every-day applications which can be observed by children of high-school age. It seems desirable that high-school biology courses include some discussion and simple demonstrations or experiments about bacteria. Because of difficult laboratory techniques and the need of rather specialized and expensive equipment bacteria do not lend themselves well to highly detailed study at the secondary school level.

In response to a request from the New England Biology Teacher's Association, the author has attempted to prepare a few notes on very simple exercises that might be carried out in high-school biology laboratories, and which will give a slight first-hand acquaintance with bacteria, and the methods of bacteriology. Nothing original is claimed for these suggestions, but if they are used for demonstrations or for class work with appropriate comments by the instructor as to the importance of each step in the exercise and discussions on such matters as distribution of micro-organisms in nature, the relation of microbes to food spoilage and fermentation generally, surgical asepsis, first-aid treatment, the cycle of the elements, and infection and immunity, they may be of educational and practical value.

A list of the minimum materials required, and instructions for eight sample exercises follow.

The following equipment and materials are necessary:

1. Microscope with at least 4 millimeter or $\frac{1}{6}$ inch objective.
2. Test tubes.
3. Petri dishes.
4. Pipettes.
5. Microscope slides.
6. Cover slips, #1.
7. Wax pencils for marking on glass.
8. Non-absorbent cotton.
9. At least 1 strain, methylene blue, best.
10. Cromel wire, #22 gauge, for inoculating needles.
11. Nutrient agar, nutrient broth, nutrient dextrose broth. (These may be purchased in powdered form from the Difco Laboratories, Inc., Detroit, Michigan, and are prepared merely by adding to water as directed.)
12. Pressure cooker, or autoclave; dry oven.

Exercise I. Infusions: To show that bacteria will grow in any organic infusion and cause putrefaction, and that all bacteria are not killed by heat.

Place beans, or meat, or any organic

* A paper presented before the New England Biological Association.

material in 2 test tubes marked "1" and "2." Fill half-way with tap water, and plug with non-absorbent cotton. Bring tube 1 to boiling point, and keep at this temperature for a few minutes. Set both tubes aside in a warm place. Examine at the end of one to five days, noting evidences of growth by appearance and odor of infusions.

After demonstrating method of sterilizing the inoculating needle in a flame, and its use in transferring material, have students prepare liquid and stained mounts from each tube for observation under the microscope.

Observe variety of cells in un-heated tube as compared with heated tube. Look for endospores and discuss their great significance in relation to sterilization procedures. In liquid mounts, observe motility.

Exercise II. Bio-Chemical Changes Caused by Bacteria

(a) Obtain bottles of pasteurized and raw milk. Pour off the cream and give each student two test tubes containing approximately 10 centimeters each of fat-free milk. Add either litmus solution or some other indicator to each tube, and have different students place these tubes at varying temperatures, as in the refrigerator, in a warm closet, and in the room.

Note from day to day progressive changes in the color, viscosity, and digestion of the casein in the different samples, and record and explain them.

(b) Prepare sugar broth in either Smith Fermentation Tubes, or test tubes with small inverted vial introduced. Sterilize in pressure cooker. Have students inoculate with bits of yeast cake, scrapings from the skin of fruit, water from the toilet, tap water. Place these in a warm place and observe from time to time for the production of gas.

(c) Place a small wad of moistened cotton in test tubes. Peel a potato and cut in strips that will fit into the tubes. With the inoculating needle streak dust, garden dirt, infusions, or other material on the surface. Plug with cotton and leave at room temperature. Usually pigment-producing yeast or bacteria will develop.

(d) Inoculate gelatin media with bacteria from infusions. Keep in a cool part of the room and observe from time to time for liquefaction of the gelatin.

Exercise III. Distribution of Bacteria

(a) Prepare agar media and sterilize in test tubes. Pour the liquefied agar into petri dishes under aseptic precautions and allow them to harden. Students are given these plates. They may expose them to the air in quiet places, in dusty atmosphere, or in front of the ventilator duct, exposing for five minutes. They may breathe gently on a plate to show normally expired breath sterile, and cough violently on another to show that bacteria-bearing droplets are ejected. Others may divide the plate into two or more sectors with the wax pencil and touch finger tips and lips to either half. A bit of saliva, a short hair, or any material may be spread upon, or placed upon the agar surface. A fly or any insect may be allowed to crawl over the surface.

Plates are incubated and examined in from two to four days for the number of colonies (individual growths) that develop.

(b) With a sterile knife, an apple or other fruit may be laid open and scrap-

ings from this with a sterile needle may be planted on the media. A frog may be pithed and dissected, and material from the body cavities, the blood, or tissues, may be tested for sterility by touching with a sterile needle and then streaking the agar plates. (Plates should always be made to control the sterility of media and glassware.)

Exercise IV. Action of Antiseptics

Several pairs of tubes of nutrient broth to which are added, respectively, a small and a relatively large amount of salt, sugar, vinegar, and any proprietary disinfectants are inoculated with bacteria obtained from previous exercises.

After four days, note the growth in tubes with the least amount of antiseptics, and its absence in those of greater concentration.

If dyes such as fuchsin or gentian violet are available, test these by adding varying dilutions to broth and inoculating with different organisms.

Transfers from tubes showing no growth to sterile tubes of broth containing no antiseptics will frequently show bacteria arrested in growth, rather than killed.

Exercise V. Disinfection

Make up aqueous dilutions with proprietary disinfectants as recommended on the labels. Inoculate with any bacteria and after five to fifteen minutes, transfer aseptically a loop to sterile broth to see whether all bacteria have been killed, as will be indicated by subsequent growth.

Exercise VI. Disinfecting Action of Light

Melt tubes of agar, and after they have cooled to a temperature that can be borne by the hand, inoculate and pour into plates. Paste a piece of dark paper in the shape of a letter, or some other shape over a portion of the bottom of the plate. Invert, and expose to the sun light for an hour and incubate. The plate will show growth only in the shaded areas.

Exercise VII. Bacteria, and Plant Growth

In the fall or spring, students may bring to class clover plants showing root nodules. Their function in fixing nitrogen for the plant may be explained. The nodules may be crushed, and the contents stained to demonstrate the bacteria involved.

Exercise VIII. Body Bacteria and Pathogenic Bacteria

Obtain applicators from the drug store and have the students swab one another's throats. Wash off in a drop of water on a clean glass slide. Dry and stain with methylene blue, and examine slides under the microscope.

Both staphylococcus (spherical forms in clumps), and streptococcus (spherical forms in chains) will usually be found present. They are indistinguishable under the microscope from the pus-forming and blood poisoning varieties of bacteria.

Slides may be obtained from your Board of Health to be used for demonstrating tubercle bacilli and other pathogenic forms.

Trips to the local Board of Health Laboratory and to a milk plant for observation and demonstration may be helpful.

Notes and News

NEW ENGLAND BIOLOGICAL ASSOCIATION MEETING

On January 14, the N. E. B. A. met at Boston University. In spite of bad driving conditions, the attendance was very good. Mr. Leo J. Fitzpatrick, the president, presided.

Miss Elna I. Perkins, Educational Secretary of the Massachusetts Tuberculosis League, spoke on "Opportunities For Correlation Of Health Education And Biology Instruction." She stressed the need for all teachers in a school whose work included any phase of health teaching, to meet, discover what each was doing, and how many students were being reached. Such a procedure, she pointed out, would show that only an eleventh or twelfth year course, taught by a full time health teacher, would give the students the information they want and need at the time when they can best receive it. Miss Perkins also cited recent studies, showed materials available free to teachers, and showed a fine sound moving picture on tuberculosis, which is loaned free to schools.

Dr. Lloyd C. Fogg, Associate Professor of Zoology, University of New Hampshire, and Director of Isle of Shoals Marine Biological Laboratory, showed slides and motion pictures of the Isle of Shoals, the University of New Hampshire Biological Station there, the buildings, laboratories, flora and fauna, and student life. New England biology teachers learned that a fine summer combination of work and play was easily available to them at Isle of Shoals.

A brief announcement of a new film service recently started at Boston University was made by Dr. Brenton R. Lutz, Chairman of the Biology Department of Boston University, who was host of the day and an afternoon speaker.

"A Method of Teaching Vertebrate Animals in a High School Biology Course" was the subject on which Mr. Ralph C. Bean, Head of the Science Department, Girls High School, Boston, spoke. He emphasized the need of supplying background for city bred students, told how he did it, and gave useful bits of technique, and chances for correlation within the subject.

A collection of recent biology texts, work books, and tests, was shown by Miss Harriet M. Fogg, of North High School, Quincy, together with mimeographed lists of the materials shown. Members were asked to comment briefly on the materials shown if they had had experience in using them. It was felt that this would be a valuable guide to those contemplating the purchase of new texts. The materials were on exhibit before and after the meeting and during the lunch hour.

Following luncheon, the afternoon program opened with a report of the delegates to the American Association for the Advancement of Science meeting at Richmond, Va.

A paper by Dr. Brenton R. Lutz, entitled "Physiological Responses to Oxygen Lack," proved to be interesting, enlightening, and especially timely because of the huge impending government airplane program and the interest in stratosphere flights. Dr. Lutz used slides to illustrate his talk.

The next meeting of the New England Association will be held on March 18th.

HARRIET M. FOGG,
Corresponding Secretary,
North High School,
Quincy, Mass.

NORTHERN INDIANA BIOLOGY TEACHERS ORGANIZE

The first meeting of the biology teachers of northern Indiana was held on Saturday, January 27th, at Rochester, Indiana. The program was a discussion on "Workbooks" lead by Mr. Arthur L. Smith, of South Bend, Indiana. With a free participation and open discussion all present were pleased with the program. They have made plans for a continuation of their meetings.

The second meeting of this group will be held on April 15th. The topic will be "Field Trips." If the weather permits an actual field trip will be part of the program. All members of the National Association who are located in northern Indiana or nearby are urged to get in touch with the officers of this new group for details of the next meeting. All biology teachers will be welcome.

The officers elected at the first meeting are as follows:

Mr. Howard H. Michaud, *Chairman.*
North Side High School,
Fort Wayne, Indiana.

Mr. A. B. Krom, *Secretary-Treasurer,*
288 N. Miami St.,
Wabash, Indiana.

KANSAS UNIT

The Kansas Unit of the National Association of Biology Teachers had its first state-wide meeting Saturday, February 4, at Wichita in conjunction with the Council of Administration of the State Teachers Association. The officers, executive board, and chairmen of the committees had a breakfast meeting preceding the regular program.

Fifty teachers of biology were in attendance. Among those present were college professors, junior college instructors, a few superintendents, but mostly classroom teachers. Every section of the state was represented.

The meeting was an enthusiastic one. Eight new members were added, making the paid-up membership fifty-six. The Constitution and By-Laws Committee presented a constitution and by-laws modelled after that of the National Association, which were adopted. The present officers and committees of the Association were continued until the next annual meeting.

BIOLOGY TEACHERS' CLUB OF SOUTHWESTERN PENNSYLVANIA

The Biology Teachers' Club of Southwestern Pennsylvania is now meeting monthly from September through May in the Cathedral of Learning, University of Pittsburgh. Field trips will be a regular feature of September, April and May.

Dr. Peter Gray, associate professor of biology, and Dr. Samuel Willims, professor of biology, will address the members at the March meeting.

At the first meeting of the National Association of Biology Teachers with the A. A. A. S. in Richmond, Virginia during the Christmas holidays the Club was represented by two of its members, Anna Conn, Uniontown High School and Marie Knauz, Peabody High School.

At the Richmond meeting this Club was made a chapter of the National Association.

Officers for the year 1938–1939 are:

President, Clifford Winnette, Canensburg High School.

First Vice President, Glen Burig, Fayette City High School.

Second Vice President, Edna Higbee, University of Pittsburgh.

Secretary, Georgianna Taylor, Bridgeville.

Treasurer, Anthony Miklaucic, Imperial High School.

ROUND TABLE STRENGTHENS TIES WITH NATIONAL

The Chicago Biology Round Table is striving to hold number one position among affiliated chapters of the National Association of Biology Teachers. At a recent meeting they voted to hold an election of national officers as prescribed by the national constitution. They also plan to collect dues for the national together with local Round Table assessments. In addition a committee of past presidents and advisors has been appointed by President Lichtenwalter to perfect their constitution and by-laws to conform to the provisions of the constitution and by-laws of the national association.

Plans for the spring meetings of 1939 are near completion. They include five meetings. The first was in January, subsequent meetings on February and March twenty-fourth, and May twelfth and twenty-seventh. These meetings are all open to any interested person that desires to attend. With the exception of the May twenty-seventh meeting which will be a field day, the meetings are held in the Medical and Dental Arts Building Cafe on the twenty-third floor. The meetings begin at 6:15 P. M. and consist of a dinner with an appropriate program following.

The January meeting was in the form of a panel discussion. The subject was "The Function of Science Clubs in Biology Teaching." The leader was Dr. O. D. Frank of the Chicago University High School. The guest leader was Miss Frances Chase of the Detroit, Michigan, Huchins Intermediate School. Miss Bessie Bell of Morgan Park High School, Chicago, Miss Thelma Jones of Bowen High School, Chicago, and Miss Jessie Potter of Parker High School, Chicago, were the other panel members. The five members of the panel are all experienced enthusiastic sponsors of science clubs. The discussion revealed that some schools have several clubs all for a definite but different purpose in the biology department.

The members are looking forward to the spring field day which is being prepared for May twenty-seventh. It will be an all day outing with a strong set of faculty leaders. Mr. Danniel and his program committee are selecting the faculty leaders from an extensive list of specialists from the Chicago region. The location of the area to be covered for the trip will be one of the many accessible spots in the Chicago area.

M. C. LICHTENWALTER

THE DETROIT BIOLOGY CLUB

Ten biology teachers organized the Detroit Biology Club between 1895 and 1900 for the purpose of reviewing and discussing magazine articles dealing with Biology. It has had a steady growth since that time and now there are over one hundred members, including teachers of general science and nature study. The area served is all of Detroit and cities within a radius of twenty-five miles. The club voted last year to affiliate with the National Association of Biology Teachers. The present officers are: President, M. A. Russell, Highland Park Junior High School; Secretary, Miss Edith Egloff, Hutchins Intermediate School, Detroit; Treasurer, Harry Hatcher, Highland Park Junior College.

M. A. RUSSELL

(Continued from page 128)

gation. Perhaps the writing of syllabi or the study and classification of the local fauna or flora would be a worthwhile and interesting problem for investigation.

Possibly there are certain local conditions that need to be studied or investigated. Just because you are a minority group is no reason for not studying local problems. Chicago is a good example. There was a misinterpretation of biology certificates as issued by the Board of Education for teachers. A delegation of members was selected, the proper authorities were approached and the situation clarified.

There is no limit to the service the local group can render its members as individuals or as a group. But the local should be well organized to start with. It should have a sufficient staff of officers including a president, assistants, recording secretary, and corresponding secretary (to contact other groups and the national), and treasurer. Two important committees should be maintained including a membership committee, and a program committee as well as others as the need may arise. Between meetings the executive board should plan how the organization may be improved. Active constructive programs should be presented and sufficiently advertised well in advance of the meeting date. A calendar should be prepared if several events are to be held during the year.

In conclusion the local affiliated chapters need the strength of the national; and the national needs the support of the local chapters. Both should work together. The several problems of the local groups are problems of the national. The latter stands ready to aid in any capacity that is needed.

M. C. Lichtenwalter

BOOKS

Gilbert, Margaret Shea. *Biography of the Unborn.* Baltimore: Williams and Wilkins Co., 1938. 132 p. $1.75.

This book that won a one thousand dollar award is a logical account of an interesting yet unknown time in every one's life. It tells the story of the development of the human infant from fertilization to birth. The story is easily read. The nine months of life before birth is described chronologically. It describes the embryonic development, fetal life and birth. A chapter on twins, variations and malformations is included.

Students of biology will profit by supplementing the textbook and laboratory course in embryology with this account of a very dramatic event in every life.

Biology teachers will note the number of times lower life is referred to. This is a significant idea when teaching the classification of plants and animals.

The story is dignified and delicately yet truthfully told. It will appeal to and fascinate the most sensitive reader. The average reader and especially the prospective parent curious about this unknown and unremembered period of his life, will find this book accurate and reliable for this undiscussed subject. Clear diagrams, a glossary, and a lack of an abundance of technical terms attract the layman to the book.

—Effie M. Hibbs

Huntington, Ellsworth. *Tomorrow's Children.* New York: John Wiley and Sons, 1935. 139 p. $1.75.

It may well be said that America's

future will lie in the hands of the children that are being born every minute now. What assurance have we that they will be physically and mentally sound? Can anything be done to provide against the inheritance of poor qualities among human beings?

"Tomorrow's Children" is written for people genuinely interested in improving the biological inheritance of the race. The material in the book consists entirely of questions and answers clearly stated in non-technical language The questions explain the ideals, principles, purposes and methods of the science of eugenics. Practically every phase of eugenics is touched upon, from various methods of limiting the population to ways of improving its quality.

This work is one of the most authoritative sources of information available pertaining to eugenics. It was written by Dr. Ellsworth Huntington, Research Associate in Geography at Yale University, with the active cooperation and collaboration of many distinguished scientists.

—ELWOOD D. HEISS

ROSENDAHL, C. O., AND BUTTERS, F. K. *Trees and Shrubs of Minnesota.* Minneapolis: The University of Minnesota Press, 1929. 385 p. $3.00.

This treatise on the trees and shrubs of Minnesota has been prepared with extraordinary care. While it has been written primarily for the use of amateur botanists, it will also meet the needs of students studying botany in colleges and universities.

The text deals with 47 families, 107 genera, 324 species, 40 varieties, 14 forms and 18 hybrids. A total of 250 species and varieties are illustrated.

—ELWOOD D. HEISS

MELANDER, A. L. *Biological Terms.* New York: Department of Biology, College of City of New York, 1937. 157 p.

Dr. Melander has presented here a

Biology Teaching Aids

Thirty-one Instructional Sound Film Subjects Produced in Collaboration with Leading Subject Matter Specialists Now Ready

PLANT LIFE SERIES

Plant Growth, Roots of Plants, Leaves, Flowers at Work, Seed Dispersal, Fungus Plants, The Dodder, Plant Traps.

ANIMAL LIFE SERIES

The Frog, How Nature Protects Animals, Beach and Sea Animals, Tiny Water Animals, Butterflies, Moths, Beetles, Pond Insects, Aphids, The House-Fly, Spiders, Birds of Prey, Thrushes and Relatives, Animal Life, Reactions in Plants and Animals.

PHYSIOLOGY SERIES

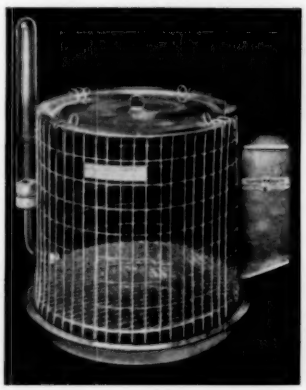
Mechanisms of Breathing, The Heart and Circulation, Body Defenses Against Disease, The Nervous System, Reproduction Among Mammals, Digestion of Foods, The Alimentary Tract, Heredity.

Others are to be Prepared

Write for Descriptive Literature

ERPI CLASSROOM FILMS INC.
35–11 Thirty-Fifth Ave.
Long Island City, N. Y.

BRING THE WORLD TO THE CLASSROOM



SANITARY

The Turtox rat cage unit illustrated here is an efficient, compact unit ideal for nutrition or breeding experiments requiring units suitable for up to three or four animals.

So constructed that wastes pass out of cage and may be removed easily without washing. The food and water dispensers are externally serviced and cannot be contaminated by the animals. Size of cage proper is 9 x 9 inches.

Price complete with water fountain and food cup $4.75

(Specify No. 220A430)

GENERAL BIOLOGICAL SUPPLY HOUSE
Incorporated
761-763 EAST SIXTY-NINTH PLACE
CHICAGO

brief text which meets a long-felt need for the busy biology teacher and student who do not have the time to delve into the origin of the many biological terms which are encountered from day to day. The book consists of two parts. Part I deals with a general treatment of several aspects concerning biological terminology. The discussion on "Classical Sources" explains the origin of many apparent meaningless biological terms. The author shows that in the evolutionary changes which have affected languages many terms are now used with meanings greatly altered from that of the original. For example, a skeleton to the ancient Greek implied a dried mummified carcass. The discussion on "Mistaken Derivations" warns us of the pitfalls which may await us should we attempt to be too literal. Rules for pronounciation are given together with a list of approximately 150 biological terms often mispronounced. A perusal of the list would probably offer some surprises to many biologists, as it did the reviewer, in that he found there words in almost constant use, yet mispronouncing them all along. A rather extended list of the more common biological suffixes are given, together with their derivation, part of speech they form, what they signify, and examples. The list of prefixes, especially those of foreign derivation, are helpful. Rules for forming plurals and the complete Greek alphabet with English equivalents are also given.

Part II, which comprises 94 pages of the book, contains a list of approximately 2,000 stems of the more common biological terms which the student of undergraduate biology is most likely to encounter. Often the entire word is given. The etymology is given and the language from which they came. Accentuation of the terms is a feature of the list. It is not the intention of the author that this list serve as a glossary or as a dictionary, but "is presented as an inspiration toward an appreciation of the foundations of biological terminology."

The author's manner of writing is free and his style is lucid. Disregarding its brevity, the book should prove of value to teachers and students of biology who, as most of us do, experience difficulty with biological terminology.

—J. A. Trent

Have You Examined
Kroeber and Wolff's
ADVENTURES WITH LIVING THINGS
A General Biology

Stimulating presentation. Simple language with gradual introduction of scientific terms. Emphasis on functions of living things and on social aspects. Excellent illustrations closely related to text. Comprehensive exercises, problems for discussion, and activities program.

D. C. HEATH and COMPANY
Boston New York Chicago Atlanta
San Francisco Dallas London

SOUTHERN BIOLOGICAL SUPPLY CO., Inc.
517 DECATUR ST.
NEW ORLEANS, LA.
CATALOGS ON REQUEST

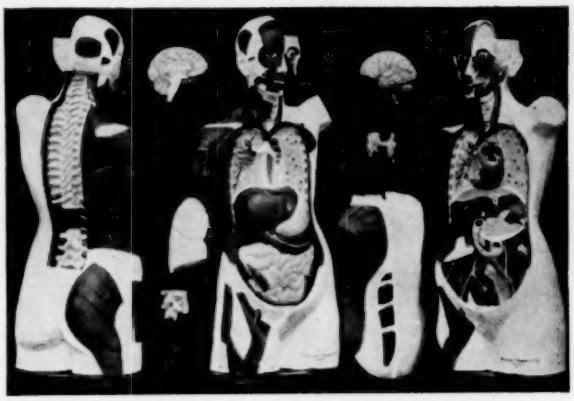
LIVING INSECT PARASITES
Demonstrate Nature's Balance
Breeding methods adopted for classrooms
No special equipment required
CALIFORNIA INSECTARIES, INC.
1612 W. Glenoaks Blvd. Glendale, Calif.

Buy AMERICAN MADE TEACHING AIDS

The Life-size Sexless Torso and Head Model illustrated here is dissectible from front and back into 13 parts. It is carefully made of fibrine composition with all parts readily removable and with all organs and structures accurately shown and clearly colored. The model is light in weight and especially serviceable for use in class work because it will stand up well under the hard usage a teaching aid of this nature must necessarily receive.

The teaching value of this model is suggested by the fact that 317 structures are accurately located on the model and identified in the Teacher's Manual. The period of usefulness of this model has been greatly lengthened by the standardization of parts so that replacements and repairs if needed are readily made at small expense.

This model meets high school and college requirements for courses in health, hygiene, physical education, physiology and biology. Complete model with cloth cover and Teacher's Manual $139.50



V9 Life-size Sexless Torso and Head Model

The Life-size Sexless Torso and Head Model described above is one of 32 excellent models produced in our Chicago Studio. These models are designed and produced by skilled artists and craftsmen. They are made of fibrine composition and are strong, light in weight, fully colored, washable and are not easily chipped or broken. We believe these models are more serviceable than any others made in America. Our representative in your State will be glad to call and demonstrate our material and give full information, or write for circular S6c illustrating and describing these models.

DENOYER-GEPPERT COMPANY

5235 Ravenswood Avenue **Chicago, Illinois**

POWERS & POWERS

High Grade Microscopic Preparations

Send for Illustrated Catalog

Lincoln, Nebraska

SOIL-LESS PLANT CULTURE

Complete outfits with chemicals and directions, adapted for class room experiments.

Priced from $3.00 to $38.50

CALIFORNIA INSECTARIES, INC.
Biological Service Dept.
1612 W. Glenoaks Blvd. Glendale, Calif.

THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

MR. P. K. HOUDEK, *Sec'y-Treas.*
ROBINSON, ILLINOIS

Enclosed please find $1.00 in payment of my membership dues (including subscription to The American Biology Teacher) for one year.

NAME Miss .....
Mrs. .....
Mr. .....

ADDRESS .....
(For journal)

SCHOOL .....

POSITION .....

Local biology teachers association of which I am a member .....

Moon and Mann's

BIOLOGY

1938 Edition

THOROUGH **PROGRESSIVE**
LIVELY **EASY**
UP-TO-DATE **TEACHABLE**

Write for a chart showing the
inexorable logic of its organization

HENRY HOLT AND COMPANY, INC.

New York Atlanta Chicago Dallas San Francisco

Have you received our

1938 CATALOG

of

BIOLOGICAL MATERIALS

If not, it will be forwarded upon
receipt of your request.

•

THE ALDEN H. FORBES LABORATORIES

1710 Renton Avenue, West View
Pittsburgh, Pennsylvania

For the

Biological Sciences

Models
Skeletons
Lantern Slides
Display Material
Preserved Material
Naturalists Supplies
Stains and Chemicals
Museum Preparations
Laboratory Glassware
Bird Skins and Mounts
Dissecting Instruments
Bacteriological Reagents
Microscope Slide Preparations
Charts, Botanical and Zoological
Insect Life-histories and Collections
Microscopes, Microtomes and
Accessories

Prompt Service NYSSCO PRODUCTS *Quality Guaranteed*

New York Scientific Supply Co.

(Formerly N. Y. Biological Supply Co.)

111–113 E. 22nd St., New York, N. Y.

No. 2000 "DURABLE" Model of Female Torso

Are all models fragile? . . . . No! . . .

"DURABLE" Models, made of *Pressed Paper,* containing *no Plaster* will not chip or break with reasonable handling . . . for *Pressed Paper* is merely paper with an added adhesive . . . molded under great pressure . . . whereas models made of *Plaster* or compositions containing *Plaster* are *fragile* . . . and may chip and break readily.

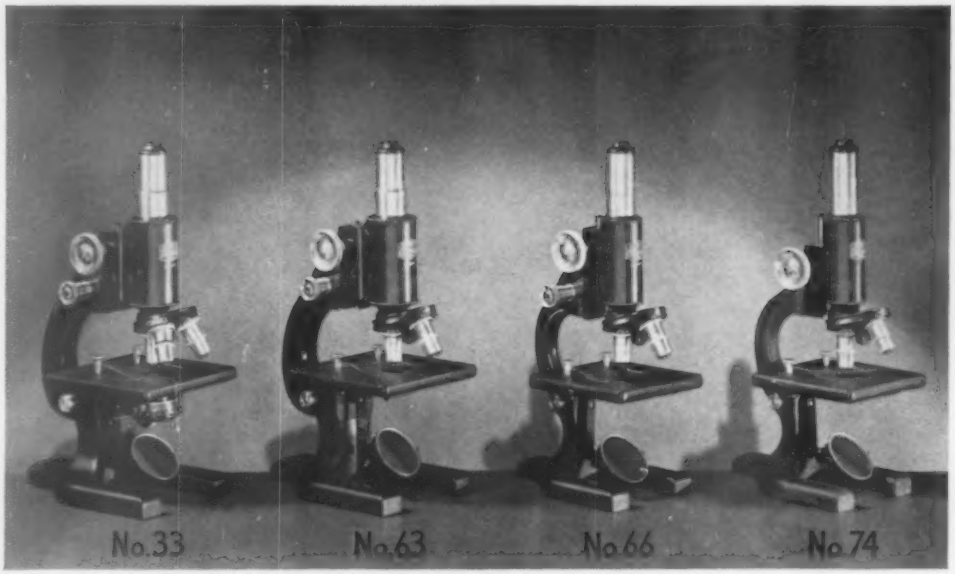
"DURABLE" HUMAN ANATOMY Models include . . . the Brain, Ear, Eye, Heart, Teeth, Torso, and other organs and systems.

"DURABLE" ZOOLOGY Models include . . . the circulatory systems of Bird, Fish, Frog, Human, Rabbit, and Tadpole . . . Crayfish, Earthworm, Mussel, Frog, Grasshopper, Hydra, Insect Life Histories and others.

Write for details, stating, if you please, models of special interest.

CLAY-ADAMS CO., INC.

44 East 23rd Street, New York



Spencer Microscopes

. . . meet every teaching need . . . available in a wide price range

No. 33. A high quality advanced laboratory instrument, generally selected for higher magnifications such as are required for bacteriological work. Accommodates all standard Spencer microscope accessories. Equipped with coarse and fine focusing adjustment, fork type rack and pinion substage, achromatic objectives with 1.25 N.A. condenser.

No. 63. A sturdy, precision instrument for routine laboratory use. Equipped with coarse and fine focusing adjustment; large stage with iris diaphragm. Will accommodate substage condenser.

No. 66. A moderately priced, standard size elementary laboratory instrument for biological work. Equipped with coarse and fine adjustment, revolving disc diaphragm and concave mirror. Highest quality optical and mechanical parts. Not designed to accommodate substage condenser.

No. 74. A low cost, standard size student instrument for classroom work requiring magnifications up to 360 X. Equipped with coarse adjustment, durable bakelite stage, revolving disc diaphragm, concave mirror. Finished in baked enamel with chromium plated parts.

Write Dept. G58 for complete details on Spencer Microscopes.

Spencer Lens Company

MICROSCOPES
MICROTOMES
PHOTOMICROGRAPHIC
EQUIPMENT

SPENCER
BUFFALO
U.S.A.

REFRACTOMETERS
COLORIMETERS
SPECTROMETERS
PROJECTORS

WILSON ORNITHOLOGICAL CLUB

The American Biology Teacher

VOL. 1 APRIL, 1939 NO. 7

General Education and Secondary School Biology - - - - - F. L. Fitzpatrick 147

Light as a Limiting Factor for Aquatic Animals and Plants - - - - - George L. Clarke 150

Pedagogia - - - T. F. Morrison 155

Sex Education with the Aid of Parents - - - P. K. Houdek 156

Biological Briefs - Ruth Sherman 158

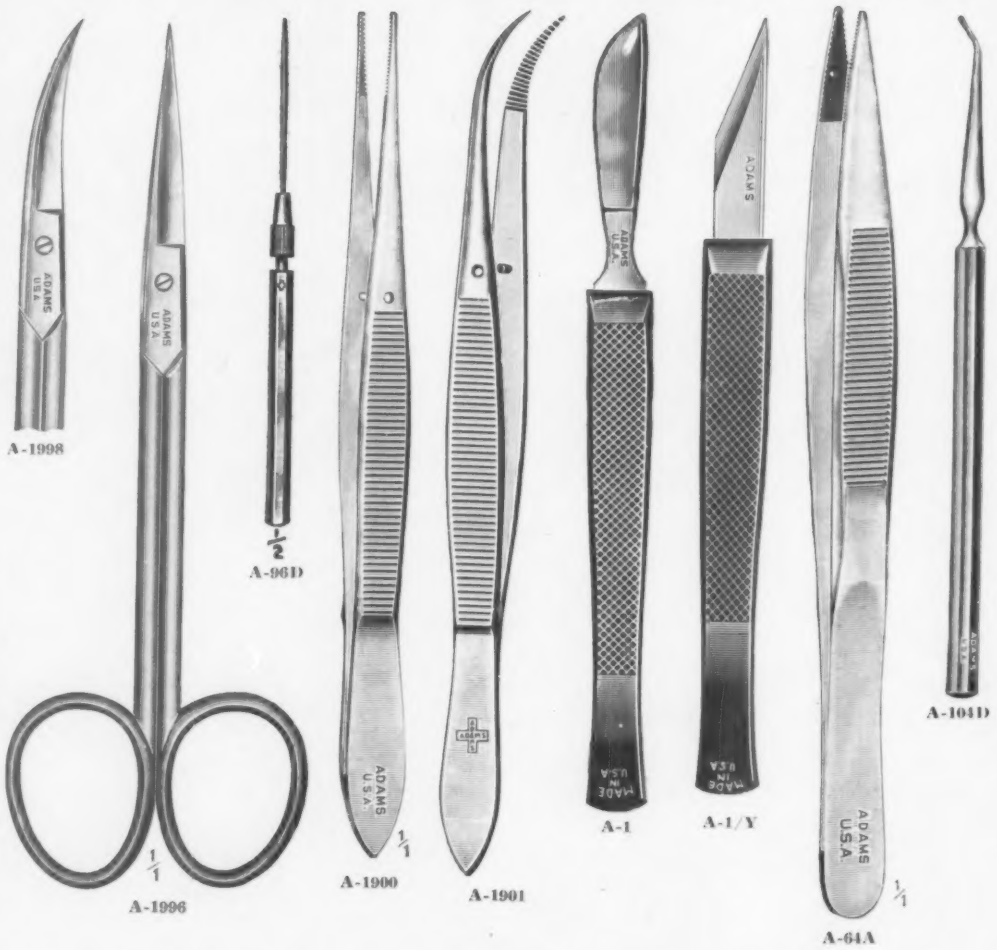
Biology as an Upper Grade Subject - - Lowell C. Frost 160

A Plan for Biology Textbook Reviews - - Allen A. Nathans 161

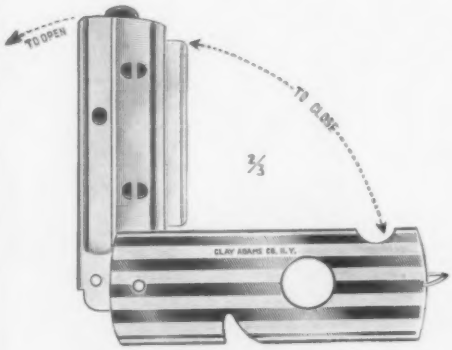
Books - - - - - - - - - - - - 162

PUBLISHED BY
The National Association of Biology Teachers

AMERICAN MADE DISSECTING INSTRUMENTS



A-1998 · A-96D · A-1996 · A-1900 · A-1901 · A-1 · A-1/Y · A-64A · A-104D



A-1 and A-1/Y

Bakelite handles of perfect balance and scientifically designed for maximum efficiency and comfort have molded into them scalpel blades made of highest grade cutlery steel.

A-40 Razor blade Knife "Super-Knife"

Takes standard double edge razor blade. Particularly well adapted for use in the biology laboratory, but also generally useful. Note that the blade can be turned around or changed in a jiffy and that the full length of the cutting edge can be used. Each in envelope with directions.

Our special catalog No. 125 illustrates and descr.bes our complete line of "Dissecting Instruments and Sets, and Science Students Supplies." *A copy will be gladly sent on request.*

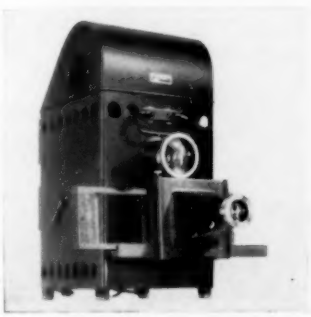
Quotations gladly supplied—please mention quantity.

CLAY-ADAMS CO., Inc., 44 East 23rd St., New York

Application for entry as second-class matter applied for.

FOR SIMPLIFIED
PRACTICAL TRAINING

B&L TYPE H MICROSCOPE



B&L BALOPTICONS

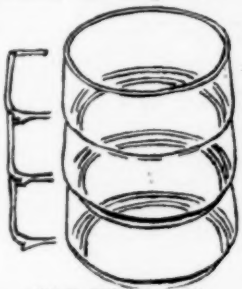
B&L Type H Microscopes are similar in all operating essentials to the instruments used in science and industry; they also are invaluable in familiarizing the student with microscopical technique he may be called upon to use in his business or professional life. For full information send for Catalog D-185.

B&L Balopticons, projecting vivid story telling pictures or diagrams so that an entire group can see, have amply demonstrated their usefulness in teaching students of all ages. For complete specifications of all models write for Catalog E-11. Bausch & Lomb Optical Co., 718 St. Paul St., Rochester, N. Y.

BAUSCH & LOMB

"THE HANDIEST DISH IN THE LABORATORY"

STANSCIEN HANDI-STACK Dishes are used in many Biological Laboratories for various purposes—such as, Small Aquaria, Culture Work, Specimen Isolation, Staining, etc.



1. They are made of Crystal Glass.
2. Easy to Stack. Easy for Observation. Saves Space.
3. Four Convenient Sizes.
4. Attractively Priced.

CAT. NO. N-1640

Sizes (Overall Dia.)	4″	4½″	8″	10″
Capacity (cc)	200	300	1600	3000
Price (dz.)	2.40	2.75	11.00	15.00

Immediate Delivery

STANDARD SCIENTIFIC SUPPLY CORP.

34-38 West 4th Street, New York, N. Y.

SERVICES FOR BIOLOGISTS

77 YEARS OLD. Ward's has supplied fine preparations for the Biological Sciences for over three-quarters of a century.

GREAT MUSEUMS. Practically every large museum of Natural history in America obtained the nucleus of its collection from Ward's.

UNIVERSITIES. Many Colleges and Universities are now using Ward's materials exclusively.

HIGH SCHOOLS. Operated not for profit, as a Foundation under the University of Rochester, Ward's are pleased to announce many fine new preparations to help the High School Biology Teacher. *Write today for illustrated catalogs and Bulletins.*

WARD'S NATURAL SCIENCE ESTABLISHMENT, INC.
EST 1862
312 W. Goodman St., Rochester, N. Y.
THE HENRY A. WARD FOUNDATION OF NATURAL SCIENCE OF THE UNIVERSITY OF ROCHESTER

THE AMERICAN BIOLOGY TEACHER

Publication of The National Association of Biology Teachers.
Issued monthly eight times during the school year from October to May.

Publication Office—N. Queen St. and McGovern Ave., Lancaster, Pennsylvania.

Correspondence concerning manuscripts may be addressed to any of the Associate editors or directly to the editor-in-chief.

Association Officers

President: M. C. Lichtenwalter, Lane Technical High School, Chicago, Illinois.

President-elect: Malcolm D. Campbell, Dorchester High School for Boys, Boston, Massachusetts.

First Vice President: George W. Jeffers, State Teachers' College, Farmville, Virginia.

Second Vice President: Lucy Orenstein, Evander Childs High School, New York, New York.

Secretary-Treasurer: P. K. Houdek, Township High School, Robinson, Illinois.

Editorial Staff

Editor-in-Chief (acting):

I. Alex. Herskowitz
Christopher Columbus High School
Bronxwood and Waring Avenues
Bronx, New York City

Managing Editor:

J. S. Mitchell
University High School
Lexington, Kentucky

Assistant Managing Editors:

Alex. A. Fried
Christopher Columbus High School
New York City

I. P. Daniel
Lake View High School
Chicago, Illinois

Associate Editors

Herman C. Arneson
Bemidji High School
Pelican Rapids, Minn.

Peter A. Blate
109 Hyde Park Pl.
Tampa, Florida

Willis W. Collins
Idabel High School
Idabel, Oklahoma

L. C. Dingess
Yuma High School
Yuma, Arizona

Ruth A. Dodge
Johnstown High School
Johnstown, New York

Philip E. Foss
Hartford Public High School
Hartford, Connecticut

Elwood D. Heiss
State Teachers College
East Stroudsburg, Pennsylvania

Melvin A. Hintz
South Milwaukee High School
South Milwaukee, Wisconsin

Charles C. Herbst
Beverly Hills High School
Beverly Hills, California

Ray Kennelty
Du Bois High School
Du Bois, Pennsylvania

M. C. Lichtenwalter
Lane Technical High School
Chicago, Illinois

Helen G. Mank
Lawrence High School
Lawrence, Massachusetts

Thomas F. Morrison
Milton Academy
Milton, Massachusetts

M. A. Russell
Junior High School
Highland Park, Michigan

Ruth Sherman
David Starr Jordan High School
Los Angeles, California

J. L. Sloanaker
North Central High School
Spokane, Washington

J. A. Trent
State Teachers College
Pittsburg, Kansas

B. Bernarr Vance
Kiser High School
Dayton, Ohio

Guy F. Williams
Colby Junior College
New London, New Hampshire

Advisory Staff

E. V. Cowdry, Washington University, St. Louis, Missouri.

W. C. Curtis, Univ. of Missouri, Columbia, Mo.

B. C. Gruenberg, Sub-Treasury Bldg., New York City.

George W. Hunter, Claremont College, Claremont, California.

Paul B. Mann, Evander Childs High School, 800 Gun Hill Rd., New York City.

D. F. Miller, Ohio State University, Columbus, Ohio.

Oscar Riddle, Carnegie Institute, Cold Spring Harbor, Long Island.

Edmund V. Sinnott, Columbia University, New York City.